

Course Title: **Neuroinformatics**

Course Code: **COMP800**

Descriptor Start Date: **15/07/2024**

POINTS: **15.00**

LEVEL: **8**

PREREQUISITE/S: **None**

COREQUISITE/S: **None**

RESTRICTION/S: **None**

LEARNING HOURS

Hours may include lectures, tutorials, online forums, laboratories. Refer to your timetable and course information in Canvas for detailed information.

Total learning hours: 150

PRESCRIPTOR

Introduces contemporary developments in Neuroinformatics (NI) and the techniques available to work with the vast amount of NI data. Students will apply computational modeling techniques to NI data and critique the process and results. The first interdisciplinary paper on the subject offered in Australasia, this paper will suit students and researchers from various subject areas. Students choose their assignment topics for individual or group work.

LEARNING OUTCOMES

1. Discuss the fundamental principles of brain information processing.
2. Critique and evaluate different neuroimaging techniques such as EEG and fMRI.
3. Critically appraise and recommend machine learning and AI techniques for brain data modelling and analysing.
4. Design an empirical study for using spiking neural network architecture to model brain activity.
5. Review and discuss brain applications in solving real-world problems, such as mental health and neurological disorders

Disclaimer: Course descriptors may be amended between teaching periods/semesters

CONTENT

1. Introduction to information processes in the brain and the nervous system.
2. Brain databases and atlases.
3. Brain data related to EEG, MRI and fMRI data.
4. AI and machine learning technologies for brain data modelling, visualising, and classification.
5. Spatio-temporal modelling of brain data related to neurological and mental diseases, such as Alzheimer's diseases and depression.
6. Brain-like computational methods - spiking neural networks.
7. Brain-Computer Interfaces (BCI).
8. Personalised modelling systems for the prediction of an individual health outcomes.

LEARNING & TEACHING STRATEGIES

- Readings, exercises using the provided online research books and articles.
- Online videos, materials, data, and NeuCube and NeuCom software that can be downloaded and installed.
- Assignments.
- Live online group discussions.
- Online forum discussion of assignments.
- Online lectures/tutorial.

ASSESSMENT PLAN

Assessment Event	Weighting %	Learning Outcomes
Preliminary report	40.00	1,2,3
Technical research report	60.00	4,5

Grade Map	MAP1
	A+ A A- Pass with Distinction
	B+ B B- Pass with Merit
	C+ C C- Pass
	D Fail

Overall requirement/s to pass the course:

To pass a course, students must attempt all assignments, and achieve a minimum overall grade of C-

LEARNING RESOURCES

Nikola Kasabov (2019), Time-Space, Spiking Neural Networks and Brain-Inspired Artificial Intelligence, Springer. <https://ebookcentral.proquest.com/lib/AUT/detail.action?docID=5507897>
Nikola Kasabov (ed) Springer Handbook of Bio-/Neuroinformatics, Springer, 2014, available to download chapters from AUT Library of eBooks: <https://link-springer-com.ezproxy.aut.ac.nz/book/10.1007%2F978-3-642-30574-0>

For further information, contact: Te Ara Auaha - Faculty of Design & Creative Technologies

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Principal Programme: AK1329, Master of Computer and Information Sciences

Related Programme/s: AK1037
AK1310
AK1329
AK2037
AK2040
AK3687
AK3745
AK3746
DJ1037
DJ1038
DJ1039
DJ1040
HA1038
HA1039
HA1040
HA2037
ICE1
INEXCH1
SABRD1

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